

<p>94-160888/20 D25 E14  INST FRANCAIS DU PETROLE  92.10.28 92FR-013080 (94.04.29) COTC 15/10/7, 9-88  Prodn of phenyl-alkane(s) - by using catalyst based on modified zeolite Y  C94-073641  Addnl. Data: JOLY J, BOITIAUX J</p>	<p>INST 92-10-28  *FR 2697246-A1  D(11-A1B1, 11-D6) E(10-J2B3) N(6-B)</p>
<p>The simultaneous prodn. of 2-, 3-, 4-, 5- and 6-phenyl alkanes is effected by the alkylation of benzene using a 9-16C linear olefin in the presence of a solid zeolite catalyst.  The catalyst comprises a matrix and a de-aluminised HY zeolite contg. hardly any extra-cellular Al, and having a Na content less than 0.15%, a cell parameter less than <math>24.35 \times 10^{-10}</math> m; and a BET surface area greater than 300 m<sup>2</sup>/g.  The process is carried out at 1-10 MPa and a temp. less than 300°C, spatial velocity of 0.5-50 and a benzene: olefin(s) molar ratio of 1-20.  <b>USE</b>  The phenyl-alkanes obtained are used in the form-</p>	<p>ulation (after sulphonation) of bio-degradable detergents.  <b>ADVANTAGES</b>  The present invention overcomes safety and disposal problems which are incurred in the usual techniques using HF- and AlCl<sub>3</sub>-based catalyst. The latter techniques also involve difficulties in sepn. of catalyst from the reaction prods.  The new catalyst are very active and resistant to de-activation, and they give selectivities similar to those obtd. in classical processes.  <b>OLEFIN REACTANT</b>  10-16C linear olefins are pref'd.  <b>PREFERRED CATALYST</b>  The matrix is chosen from a clay, alumina, silica, magnesia, zirconia, oxides of titanium and boron, or a combination.  The Si:Al ratio is 8-70 (more pref. 15-25). The zeolite content of the catalyst is 20-98% (more pref. 40-98%).  FR2697246-A*</p>

The cell parameter is between  $24.38 \times 10^{-10}$  m to  $24.31 \times 10^{-10}$  m, and the surface area is more than 450 m<sup>2</sup>/g.

**PREFERRED CONDITIONS**

The prod. obtd. from the alkylation zone is fractionated into:

- (a) a first fraction contg. unconverted benzene,
- (b) a second fraction contg. at least one un-converted linear olefin;
- (c) a third fraction contg. phenyl-alkanes; and
- (d) a fourth fraction contg. at least one poly-alkyl benzene, which is re-cycled to the alkylation reactor.

Prof. at least part of the first and second fractions is recycled to the reactor zone.

**EXAMPLE**

A catalyst was prepared using as prim. material a zeolite NaY of formula  $\text{NaAlO}_2(\text{SiO}_2)_{2.5}$ , which had the following characteristics: global Si:Al atomic ratio = 2.5; crystal parameter ( $a_0$ ) =  $24.89 \times 10^{-10}$  m; water vapour adsorption capacity (25°C) = 16%; surface area 890 m<sup>2</sup>/g.

This was subjected to 5 exchanges with 2M  $\text{NH}_4\text{NO}_3$  soln. at 85°C for 1.5 hr, to give a zeolite  $\text{NH}_4\text{Y}$  contg. 0.95% Na. This was stabilised in an oven at 770°C for 4 hrs. and then subjected to an acid treatment with 3N.  $\text{HNO}_3$ .

(9 cm<sup>2</sup>/g of solid) at 85°C for 3 hrs. followed by a similar treatment, but with 0.5N.  $\text{HNO}_3$ .

The zeolite obtd. contain 0.2% Na, had an Si:Al global atomic ratio of 28, crystalline parameter ( $a_0$ ) equal to  $24.24 \times 10^{-10}$  m, surface area 770 m<sup>2</sup>/g, and water absorption capacity of 5%. It was formed into extrudates with 20% of alumina and calcined at 550°C. This was designated catalyst (B).

A similar catalyst (but not conforming to the invention) was prepared from mordenite zeolite (catalyst A).

The 2 catalysts were tested in the alkylation of benzene by 1-dodecene at 50°C, 4 MPa, LHSV 3 x vol. of catalyst, and benzene to 1-dodecene ratio of 5.5. The results are as follows:

<u>Charge compsn. (%wt)</u>	<u>Catalyst A</u>	<u>Catalyst B</u>
Benzene	71.7	72.3
1-dodecene	28.3	27.7
<u>Prod. compsn. % wt.</u>		
2-phenylalkane	77.34	28.92
3-phenylalkane	10.83	20

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4-phenylalkane	0.88	19
5-phenylalkane	0	11.5
6-phenylalkane	0	11.48
Di:dodecylbenzene	10.10	10
Heavy residus	0.75	1.1

From this it can be seen that only catalyst (B), contg. de-aluminised zeolite Y, gave a homogeneous distribution of phenyl-alkanes (similar to that generally obtd. with HF or AlCl<sub>3</sub> catalysts), whereas catalyst A gave mainly 2- and 3-phenylalkanes. (13pp2603EDDwgNo0/0)

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